

WHAT IS CLAIMED IS:

1. An image-processing apparatus which expresses images as bit map data having a latent image area and a background area in order to discourage illegal copying of images, the image-processing apparatus comprising:

an image generator which generates a new image by expressing the latent image area with dots of a first dot size and the background area with dots of a second dot size which is different from the first dot size; and

an information-attaching unit which receives additional information capable of distinguishing an original image from a copy,

wherein the information-attaching unit then attaches the additional information to at least the latent image area of the image generated by the image generator.

2. An image-processing apparatus according to Claim 1, wherein the image generator sets the first dot size smaller than the second dot size and sets intervals between the dots in the latent image area smaller than intervals between the dots in the background area.

3. An image-processing apparatus according to Claim 1, wherein each of the dots includes two or more pixels.

4. An image-processing apparatus according to Claim 1, wherein the information-attaching unit controls the position of each of the dots included in the latent image area in accordance with a bit value at the corresponding bit position in the additional information.

5. An image-processing apparatus according to Claim 1, wherein the information-attaching unit controls the size of each of the dots included in the latent image area in accordance with a bit value at the corresponding bit position in the additional information.

6. An image-processing apparatus according to Claim 1, further comprising a composite-image generator which generates a composite image of the image generated by the image generator and a document image.

7. An image-processing method for processing an image including a latent image area and a background area, the image-processing method comprising:

an image-generating step of generating a new image by expressing the latent image area with dots of a first dot size and the background area with dots of a second dot size which is different from the first dot size; and

an information-attaching step of attaching additional information to at least the latent image area of the image generated in the image-generating step.

8. An image-processing method according to Claim 7, wherein, in the image-generating step, the first dot size is set smaller than the second dot size and intervals between the dots in the latent image area are set smaller than intervals between the dots in the background area.

9. An image-processing method according to Claim 7, wherein, in the information-attaching step, the position of each of the dots included in the latent image area is controlled in accordance with a bit value at the corresponding bit position in the additional information.

10. An image-processing method according to Claim 7, wherein, in the information-attaching step, the size of each of the dots included in the latent image area is controlled in accordance with a bit value at the corresponding bit position in the additional information.

11. An image-processing method according to Claim 7, further comprising a composite-image-generating step of generating a composite image of the image generated in the

image-generating step and a document image.

12. An image-processing apparatus which processes an image including a latent image area and a background area, the image-processing apparatus comprising:

an image generator which generates a new image by expressing the latent image area with dots of a first dot size and the background area with dots of a second dot size which is different from the first dot size; and

an information-attaching unit which attaches additional information to the latent image area and/or the background area of the image generated by the image generator,

wherein the information-attaching unit controls the position or the size of each of the dots included in the latent image area and/or the background area in accordance with a bit value at the corresponding bit position in the additional information.

13. An image-processing apparatus according to Claim 12, wherein the image generator sets the first dot size smaller than the second dot size and sets intervals between the dots in the latent image area smaller than intervals between the dots in the background area.

14. An image-processing apparatus according to Claim

12, wherein each of the dots includes two or more pixels.

15. An image-processing apparatus according to Claim 12, further comprising a composite-image generator which generates a composite image of the image generated by the image generator and a document image.

16. An image-processing method for processing an image including a latent image area and a background area, the image-processing method comprising:

an image-generating step of generating a new image by expressing the latent image area with dots of a first dot size and the background area with dots of a second dot size which is different from the first dot size; and

an information-attaching step of attaching additional information to the latent image area and/or the background area of the image generated in the image-generating step,

wherein, in the information-attaching step, the position or the size of each of the dots included in the latent image area and/or the background area is controlled in accordance with a bit value at the corresponding bit position in the additional information.

17. A program for causing a computer to execute the image-processing method according to Claim 7.

18. A program for causing a computer to execute the image-processing method according to Claim 16.

19. A computer-readable storage medium which stores the program according to Claim 17.

20. A computer-readable storage medium which stores the program according to Claim 18.

21. A method for distinguishing between an original and a copy of a printed material, the method comprising:  
scanning an image of the printed material;  
extracting, if available, embedded information from the scanned image of the printed material,  
wherein the embedded information is for determining that the image is an original image; and  
comparing the embedded information with stored information to determine that the image is original.

22. The method of Claim 21 wherein the embedded information is a random bit string.

23. The method of Claim 21 wherein the embedded information is a digital signature of textual information.

24. The method of Claim 21 further comprising,  
expressing the image of the printed material with a  
plurality of dots; and

reading the embedded information based on a  
displacement direction of a first dot from an original  
position.

25. The method of Claim 24 further comprising,  
representing the displacement of the first dot by a  
vector ( $x_m$ ,  $y_m$ ); and

displacing the first dot such that the vector is  
positive.

26. The method of Claim 24 further comprising,  
representing the displacement of a second dot by a  
vector ( $x_m$ ,  $y_m$ ); and

displacing the second dot such that the vector is  
negative.

27. A method for determining whether an image is an  
original or copy, the method comprising:

receiving the image having a first region and a second  
region,

wherein the first region is reproducible when it is

copied and the second region is not reproducible when copied;

examining either the first region or the second region to extract embedded information that indicates whether the image is a copy or an original; and

comparing, if the embedded information is extracted, the embedded information with authentication information to determine that the image is original.

28. The method of Claim 27 wherein the embedded information is attached to the first region.

29. The method of Claim 27 wherein the embedded information is attached to the second region.

30. The method of Claim 27 wherein the embedded information is attached to the first and the second region.

31. The method of Claim 27 further comprising determining that the image is a copy if the embedded image cannot be extracted.

32. The method of Claim 27 wherein the embedded information is a random bit string.



33. The method of Claim 27 wherein the embedded information is a digital signature of textual information.

34. The method of Claim 27 further comprising,  
expressing the first region with a plurality of dots of a first size; and

expressing the second region with a plurality of dots of a second size.

35. The method of Claim 34 further comprising,  
attaching the embedded information based on a displacement of the plurality of dots in the first region and based on first predetermined rules.

36. The method of Claim 34 further comprising,  
attaching the embedded information based on a displacement of the plurality of dots in the first region and based on second predetermined rules.

37. The method of Claim 34, wherein intervals between the dots in the first region are set smaller than intervals between the dots in the second region.

38. The method of Claim 34 further comprising,  
attaching the embedded information based on a

displacement of the plurality of dots in the second region and based on first predetermined rules.

39. The method of Claim 34 further comprising, attaching the embedded information based on a displacement of the plurality of dots in the second region and based on second predetermined rules.

40. The method of Claim 34 further comprising, attaching the embedded information based on an arrangement of the plurality of dots and on first predetermined rules.